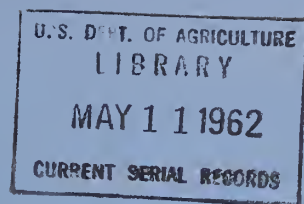


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BIRD HAZARD TO AIRCRAFT



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

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BIRD HAZARD TO AIRCRAFT

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Birds have long been recognized as a potential hazard to aircraft. During the early days of aviation when airplane speeds were relatively slow, damage from bird strikes usually was minor and largely confined to broken windshields and occasional damage to the fuselage. However, since World War II and the introduction of jet aircraft the problem has become more serious. In addition to greater damage resulting from impact with birds at high speeds, the ingestion of birds in jet and prop-jet engines has become a hazard.

During the past decade many birds became accustomed to the noise and speed of piston-driven aircraft and formed the habit of using airports without danger to themselves or to aircraft. With the advent

of jet and turbo-jet engines, however, the tremendous suction into air intakes has become an added factor. Furthermore, some birds have acquired the habit of resting on portions of runways not normally used by piston-driven aircraft. The longer runways and more complete use of runways required for jet planes thus pose a new problem; birds have not developed the ability to avoid a jet-powered aircraft.

The Bureau of Sport Fisheries and Wildlife is undertaking a study of this problem in cooperation with the Federal Aviation Agency, the Air Transport Association, and local airport management personnel. It is anticipated that the investigation will provide data on the nature and extent of bird strikes and that new measures will be developed which can be used to minimize such hazards. Meanwhile, airport managers are urged to make observations on the occurrence of birds in the vicinity of airfields under their jurisdiction. Such observations should be reported to the Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.

The information in this leaflet has been compiled with the help of representatives of the Federal Aviation Agency, the Department of Defense, the Air Transport Association, local Audubon societies, and airport management. Their cooperation and assistance are gratefully acknowledged.

HISTORY OF THE PROBLEM

Records of bird strikes during the early days of aviation are fragmentary. During World War II military agencies recognized that sea birds constituted a hazard at bases on oceanic islands, notably at Midway Atoll in the North Pacific and Ascension Island in the South Atlantic. Sooty terns and albatrosses were the principal trouble makers. The problem still exists although corrective measures have decreased the hazards appreciably. For example, land leveling operations at Midway have reduced perceptibly albatross soaring activities over the runway at that airfield. A number of incidents have also occurred in the United States where the presence of gulls was associated with the close proximity of dumps to airfields and where small birds were attracted by weed growths adjacent to runways. Similar problems have been encountered in Great Britain involving plovers, pigeons, and crows. In the States, most of the recent strikes have involved sea gulls. A few included swallows, hawks, pigeons, ducks, geese, and starlings. The largest number of bird strikes have occurred during the summer and fall months, as expected, since these are the times of year when bird populations are at their peak. The greater number of strikes in the fall further reflects the autumnal bird migration.



Black-footed albatrosses at U. S. Naval Station, Midway Islands.

BIRDS IN FLIGHT

Much remains to be learned about the altitudes at which birds fly under various weather conditions at different seasons of the year. The following is a general summary of bird flight information as known at present. Although primary emphasis is given here to coastal areas and major water courses, heavy concentrations of waterfowl and other large birds also occur over a number of wildlife refuges in various parts of the United States. Persons interested in potential hazard areas in specific States should contact the Bureau of Sport Fisheries and Wildlife and State conservation departments for details relating to local bird concentration areas.

Songbirds generally fly within 5,000 feet of the ground. At night these small birds commonly fly as widely scattered individuals rather than in dense flocks; at times, however, concentrations may build up at night over shorelines when prevailing winds have a tendency to drift the birds toward the ocean or the Great Lakes. During daylight hours some species of songbirds fly in dense flocks.

Concentrations of large-sized birds are more frequent in coastal than in inland localities. Unfortunately, many major airports have been constructed in tidal locations -- even on reclaimed land partially surrounded by tidewater. This automatically creates serious and complex problems because of the variety of birds and the heavy transient populations that pass through coastal areas even when the airport itself offers no particular attraction.

From what is known of the geography of bird abundance in the United States, the Atlantic, Pacific, and gulf coasts and adjacent marshes would be potential hazard areas below 6,000 feet, day and night, from late August through late April. The hazard would continue locally through the summer on the coasts of Maine, New Hampshire, and Massachusetts (gulls up to about 4,000 feet); Connecticut to North Carolina (terns, chiefly below 500 feet; gulls in some areas up to 4,000 feet); South Carolina to and including Texas (pelicans, terns, and herons, chiefly below 500 feet; gulls in some areas up to about 4,000 feet); and on the Pacific coast and offshore islands (gulls and cormorants up to about 4,000 feet). The majority of coastal birds are within 5 miles of shore, but tens of thousands of large, low-flying shearwaters (mostly below 500 feet) may be present, especially off the central and southern California coast, June through August.

Chesapeake Bay, the North Carolina sounds, San Francisco Bay, and Puget Sound have high concentrations of waterfowl and gulls from October to mid-April, and much lower numbers through the summer months.

The Great Lakes, especially their shores and islands, are used by waterfowl (particularly during August-November and March-April) and gulls (locally in June-July, widespread during rest of year but less common in northern half in December, January, and February) and may constitute a hazard up to about 4,000 feet.

The Mississippi, Missouri, and Ohio river valleys are used, day and night, by large numbers of waterfowl and gulls, especially during the migration seasons, March-April and September-November. The lower half of the Mississippi River and adjacent streams and marshes are used extensively by waterfowl throughout the winter months. The great majority of the birds are below 3,000 feet in winter and below 6,000 feet during migration.

CONDITIONS THAT ATTRACT BIRDS TO AIRPORTS

There is no habitat, either natural or man-made, that will not attract certain species of birds at some season of the year. For this reason, the

objective when planning to reduce a bird hazard is to render the airport and its vicinity less attractive to those species that are a potential hazard -- not to strive for the impossible goal of a birdless community.

Birds that occur on or over airfields probably are there for one of five reasons: (1) In search of food or water; (2) roosting; (3) resting or loafing; (4) nesting; or (5) passing by, which includes traveling between roosting, feeding, and resting areas as well as active migration.

Food. -- Most airport areas provide an abundance of food in the form of weed seeds, grass seeds, berry-producing shrubs, earthworms, grubs, and other insects. Many airports have inadequate refuse disposal systems, such as an active dump on their property, or there may be a large municipal dump, or sewage outlets nearby. Some have ponds or other permanent bodies of water near or even between active runways; many have temporary rain pools that at certain seasons of the year may persist for days at a time.

Roosting. -- Cover in the form of tall reeds, shrubs, trees, or weed patches may provide convenient roosting places. They may even attract birds such as starlings or blackbirds from many miles away. An infrequently used runway may serve as a night roosting place for a flock of gulls. Ponds may provide roosting places for waterfowl and other water birds at night. Almost any area that is free from disturbance may provide a suitable roosting site for one or more species of birds.

Resting or Loafing. -- Gulls stand around for hours at a time between flights to feeding areas. Most shore birds (sandpipers and plovers) feed primarily on exposed mud flats in tidal areas. At high tide they rest in large flocks on beaches, golf courses, spoil banks, or on other open areas such as those created by dredging operations. Blackbirds and starlings frequently rest in the tallest vegetation near their feeding areas.

Nesting. -- The species of birds nesting on an airport depend upon the habitat and the amount of disturbance present. Once nesting of a species has been established, the same individuals can be expected to return year after year. Some of their surviving offspring can be expected to return and nest in the same area. The nesting density that ultimately will be reached depends upon the particular species, the type of cover, location, and the amount of disturbance.

Migration. -- The annual migration of birds northward in spring and southward in fall brings a variety of birds past almost every airport in the country. The migration dates vary from species to species and from area to area. The abundance of a given species may vary from year to year,

depending upon weather conditions and other factors. On nights when a heavy migration coincides with low overcast, fog or drizzle, many small birds may be attracted to ceilometer beams. Some airports in the immediate vicinity of cities may have a late afternoon and early morning flight of many thousands of starlings passing over enroute between a city roost and a rural feeding area. Airports in tidal areas may have flocks of shore birds traveling back and forth over the runways in moving from one exposed flat to another.

REMEDIAL MEASURES

If it is determined that a potential hazard exists due to the presence of birds, the first step is to identify the species involved and the factors that attract these birds to the airport. The second step is to determine whether a particular bird problem is temporary in nature or whether it will persist or recur. Many situations involve migrating individuals that are readily dispersed from the area and will not return once they have been frightened away. In other cases, the birds may be resident species which feed, rest, or roost on the airport grounds. The third step is to decide which remedial measures are most practical.

When a heavy concentration of a particular bird species constitutes a serious hazard, it may be necessary to give preference to immediate but temporary relief methods. On the other hand, if situations exist that currently or may in the future attract birds in dangerous numbers, steps should be taken to make the habitat on and in the vicinity of the airport less attractive to them.

Most concentrations of birds that occur during the spring and fall migration seasons are comprised of species that will be present for only a few days. Scaring devices generally are effective in these instances. On the other hand, summer or winter resident birds may gradually learn that scaring devices are relatively harmless, in which case other methods must be employed to reduce the hazard.

As long as attractive conditions exist on airports, birds will continue to take advantage of the situation. Much can be done to make such areas unattractive. The following are a few of the steps that can be taken toward a permanent rather than a temporary reduction of concentrations.

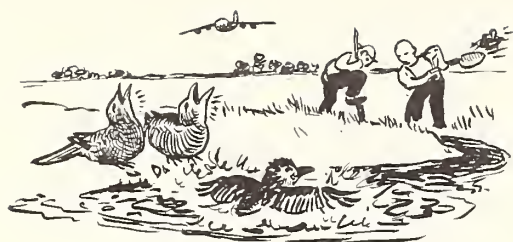
1. Elimination of dumps and other unsanitary conditions. Any dump or sewage disposal area in close proximity to the airport can be a definite hazard because of the large number of gulls, starlings, and other birds that are attracted to waste food. Even careless disposal of relatively clean trash may attract birds for short periods.



2. Potential roosting sites for flocking birds should be destroyed. Tall reeds, weeds, or brush may attract thousands of starlings and blackbirds, especially in fall and winter. Such cover may serve as roost sites for blackbirds and starlings, as well as for rodents and rabbits, which in turn attract birds of prey.

3. Berry- or seed-producing shrubs and weeds that are attractive to wildlife should either be removed altogether or replaced by less attractive species. If a line of shrubs is needed for a snow fence or a windbreak, it should be kept free of weeds. Use of shrubs which produce abundant fruits or seeds of known value as wildlife foods should be avoided insofar as possible.





4. Ponds and other bodies of water should be drained or otherwise eliminated. Shallow impoundments in the immediate vicinity of runways should be well drained and the depressions filled to reduce even temporary rain pools to a minimum. Many species of birds are attracted to water for drinking and bathing purposes.

SCARE DEVICES

Research on bird control, particularly in connection with agriculture, has resulted in the discovery and manufacture of a number of devices which, if used correctly and under the proper conditions, have proven successful in repelling temporarily a number of species of birds. The following types of devices and materials are on the market and should be considered for applicability to airport bird problems if conditions warrant. This list is incomplete and does not include all manufacturers of scare devices and materials, nor does it imply Government endorsement of the products mentioned.

Automatic Acetylene Exploders. -- Machines that ignite acetylene gas to produce loud explosions at regular intervals by dripping water on calcium carbide or from a tank of compressed acetylene gas. They are not injurious to birds, but the loud reports may be objectionable in residential areas.

Exide Thunderbird		Reed-Joseph Co.
or	-	Highway 1
Scare Away		Greenville, Mississippi
Zon	-	B. M. Lawrence Co.
		244 California Street
		San Francisco 11, California

Exploding Shotgun Shells. -- This is a 12-gauge shotgun shell containing, instead of pellets, a king-sized firecracker which is projected a distance of 100 yards or more before exploding.

B. M. Lawrence Co., 244 California St., San Francisco 11, California
 K. K. Hori Co., Inc., 5833 Perry Drive, Culver City, California, or
 100 West Chicago Avenue, Chicago 10, Illinois

Pyrotechnics: Fireworks. -- Firecrackers, inserted at intervals in slow-burning fuse ropes, have been useful in keeping birds away from agricultural crops. Dealers marked with an asterisk make and distribute completed ropes of firecrackers designed to explode at periodic intervals. The dealer marked with a number sign specializes in cotton fuse rope.

- * Alpha Enterprises, Inc., P. O. Box 12242, Houston, Texas
- # J. E. Fricke Co., 40 N. Front St., Philadelphia 6, Pennsylvania
- * Red Devil Fireworks Co., 5415 E. Century Blvd., Lynwood, California

Firecrackers, salutes, skyrockets, roman candles, and other devices have been used to drive birds from crops and to discourage roosting. These are standard items and may be purchased from regular firecracker manufacturers.

Birds gradually become accustomed to noise; therefore, it is best to move the exploders around occasionally and operate them only when necessary. They should not be operated during the dark of night but should be started at daybreak and dusk. Exploding shell crackers should be used occasionally in between explosions of the acetylene exploders. The number of exploders needed will depend upon the size of the airport and the severity of the bird problem.

Many States and cities have laws or ordinances prohibiting the use of fireworks. Investigate local city ordinances and State laws regulating the possession or use of fireworks or explosives, also local fire laws.

OTHER WILDLIFE

Rabbits, deer, and moose also have been involved in collisions with aircraft moving along runways. Specific information regarding their control or management is available through field offices of the Bureau of Sport Fisheries and Wildlife and State conservation agencies.

RESEARCH

Intensified studies are being initiated (1) to obtain more information on the extent and nature of the bird problem in all sections of the country; (2) to test commercial materials and devices marketed or proposed for use in bird control at airports; (3) to determine the potential usefulness of sterility-producing agents and selective lethal chemicals; (4) to investigate sonic, ultrasonic, and electronic media as bird deterrents; and (5) to observe bird behavior and responses in problem areas. It is

anticipated that these long-range studies will bring about the discovery and development of new and improved control techniques.

TECHNICAL ASSISTANCE

Technical consultation regarding bird control may be obtained from regional offices of the Bureau of Sport Fisheries and Wildlife. These are listed below:

Region 1 (Cal., Idaho, Mont., Nev., Ore., Wash.); Interior Bldg., 1001 N. E. Lloyd Blvd., Portland 14, Ore. (BElmont 4-3361)

Region 2 (Ariz., Colo., Kans., N. M., Okla., Tex., Utah, Wyo.); Federal Office Bldg., 517 Gold St., S. W., Box 1306, Albuquerque, N. M. (CHapel 7-0311)

Region 3 (Ill., Ind., Iowa, Mich., Minn., Mo., Nebr., N. D., Ohio, S. D., Wis.); 1006 W. Lake St., Minneapolis 8, Minn. (FEderal 9-3612)

Region 4 (Ala., Ark., Fla., Ga., Ky., La., Md., Miss., N. C., S. C., Tenn., Va.); 620 Peachtree-7th Bldg., Atlanta 23, Ga. (TRinity 6-3311)

Region 5 (Conn., Del., Me., Mass., N. H., N. J., N. Y., Pa., R. I., Vt., W. Va.); 1105 Blake Bldg., 59 Temple Pl., Boston 11, Mass. (CApitol 3-2961)

Region 6 (Alaska); Box 2021, Juneau (Phone: 6-3546)

Remains of birds involved in aircraft strikes, including fragments removed from jet engines may be sent to the Bird and Mammal Laboratories, Bureau of Sport Fisheries and Wildlife, Room 61, U.S. National Museum, Washington 25, D.C., for identification. Fleshy remains should be frozen or preserved in formalin or alcohol before shipping. Dry remains require no special treatment.

Many species of birds frequenting airports are protected by Federal or State laws. Their legal status should be determined before any lethal controls are attempted. In some cases the laws contain provisions to obtain permits to destroy those individual birds which are causing depredations or are injurious to the best interests of society.

